Chemical Storage Container and Process Equipment Leak Detection

Content

1.0 Purpose/Scope This field procedure documents the BNL testing mechanism for using direct reading meters or indicator tubes (detector tubes) to test for leaks from containers of chemicals. When used in conjunction with an established detection system procedure, such as SHSD IH75170 or IH75175, it allows relatively inexperienced field testers to gain accurate, instantaneous results. This procedure was specifically prepared to detect routine storage vapor/gas leaks of Methylene Chloride, Ethylene Oxide and Formaldehyde. Its use, or an equivalent procedure, is required for these chemicals. This procedure can be used for other OSHA regulated chemicals (including Benzene and 1,3-Butadiene) and other extremely hazardous chemicals.

This procedure is not intended for use in measuring employee exposure levels during routine operations or emergency situations (such as large spills of chemicals from container failures). SHSD Procedure IH75140 is used for quantifying employee exposure levels and determining compliance with occupational exposure limits and requires training and qualifications beyond the level of this procedure. This procedure is not intended to measure the environmental consequences of releases.

Indicator tubes or direct reading instrumentation can provide reliable atmosphere concentration measurements for more than 120 hazardous gases and vapors, including all OSHA regulated substances.

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2.0 Responsibilities

2.1 This procedure will be implemented through the SHSD Industrial Hygiene Group, RCD Facility Support Group, or chemical container owners in BNL organizations to address concerns of atmospheric contaminants from routine storage leak. Only persons who thoroughly understand this procedure and the corresponding procedure for the detection equipment should conduct this testing.

2.2 The responsibility to perform this test or to have appropriately skilled individuals perform this test lies with the chemical container owner and their line management.

3.0 Definitions

3.1 ***Indicator Tubes***: A detection system using a manually operated piston or bellows pump and glass tubes filled with treated chemical granules specific for the substance.

3.2 ***Direct Reading Instrumentation***: An electronic meter with a sensor that detects a particular chemical substance. The meter presents a real-time (instantaneous) display in concentration of the chemical sensed by the detector.

3.3 ***Leak:*** An unplanned release of chemical into the work environment. For the purpose of this procedure, BNL classifies a leak into two levels of severity:

3.3.1 **Emergency Leak** (also called a spill): A major event release in which a large quantity of chemical is inadvertently released that potentially creates significant airborne concentrations in the worker's breathing zone. This type of release is not covered by this procedure. Monitoring the airborne concentration in these events in documented in the BNL Emergency Plan and IH75140.

3.3.2 **Routine Storage Leakage:** The continuous loss of minute quantities of chemical (typically by volatilization) from the interface between two sealing surfaces of a sealed container (such as a closed lid) or in process equipment (such as a closed piping system or reaction vessel). This type of release is the target of this monitoring procedure.

4.0 Prerequisites

4.1 Prior to testing, the detection equipment must meet the requirements of its BNL method and manufacturer recommendations.

4.2 **Personnel Qualification**

4.2.1 Only persons who thoroughly understand this procedure and have demonstrated competency to the satisfaction of their supervision should conduct this testing.

4.2.2 Only persons who thoroughly understand the hazards of the chemical being sampled and have documented training in Hazard Communication or Laboratory Standard and the BNL OSHA Regulated Chemical specific training module for the chemical should conduct this testing.

4.3 **Hazard Assessment of area**: The actual task of using a direct reading tube or meter typically does not pose significant employee health risks. But by its very nature, this SOP may be performed in areas with chemical or radiation contamination, and these hazards must be assessed on a case-by-case basis. Do not perform sampling until a competent individual has assessed the hazards of the area.

4.4 Personal Protective Equipment: Appropriate personal protective equipment to protect the person collecting the sample must be used when implementing this procedure.

4.4.1 Where the potential for contamination of the body can occur, the use of disposable clothing to cover the areas of contact is required.

- **Hand:** Use of a meter in areas of known or suspected chemical or radiological contamination requires the use of disposable gloves. Exam-style, splash gloves are acceptable. Acceptable elastomers are: Nitrile, PVC, and Natural Rubber.
- **Body:** If contact of the body with contaminated surfaces is anticipated, a disposable suit should be used. Acceptable CPC materials include: Tyvek®, KleenGuard®, and cotton. Disposable garments must be discarded as mercury waste if contact with contamination has occurred. If personal clothing items become contaminated, they must be surrendered for BNL cleaning or disposal.
- **Foot:** If contact of the feet is anticipated with contaminated surfaces, disposable shoe coverings, boots or booties should be used. Acceptable CPC material include: Tyvek®, KleenGuard®, and rubber. If personal shoes become contaminated, they must be surrendered for BNL cleaning or disposal.

4.4.2 **Respiratory:** Under normal use, respiratory protection is not required. If chemical or radiological levels from contamination in the area exceed (as indicated by the direct reading meter) or are likely to exceed the OSHA, ACGIH, or DOE standards, respirators are required. A half face or full face APR or PAPR respirator with appropriate cartridge or an air line respirator may be used up to the assigned

protection factor listed in the BNL's Respiratory Protection Selection and Issuance SOPs.

4.4.3 **Eye:** Safety Glasses with side shields are required in all laboratories, construction, and general industry work areas.

4.5 **Work Planning:** All requirements of work permits and work planning system reviews must be met in performing this procedure.

4.6 **Environmental Impact and Waste Disposal:** Direct Reading meters do not have adverse impact on the environment or create waste for disposal. Indicator Tubes are considered hazardous waste and must be disposed of in accordance with BNL Waste Management Division requirements.

5.0 Precautions

5.1 Verify that interfering compounds, as identified by the manufacturer of the detection system, are not present.

5.2 Verify the testing personnel will not be exposed to hazardous airborne levels of the chemical by testing the highest probability leak source first and testing all sources in an manner that does not place the tester's breathing zone in vicinity with a suspected leak source. Use appropriate respiratory protection if necessary and approved by the RCD Facility Support Group or SHSD IH Group.

6.0 Procedure

6.1 **Determine the need for sampling.** The following type of container storage conditions are <u>exempt</u> from mandatory periodic sampling:

6.1.1 Never opened containers in undamaged condition.

6.1.2 Containers stored in a mechanically ventilated cabinet, laboratory hood, or other ventilated area that does not include the worker's breathing zone.

6.1.3 Containers (such as bottles or cans) that have a compatible and impermeable seal at the opening, such as "electrical tape" or shrink wrap. See Attachment 8.2 for a list of evaluated chemicals and appropriate storage conditions.

6.1.4 Containers stored in a secondary container/wrapper (such as a "Zip-Lock bag" or jar) when such barrier is compatible and

impermeable to the chemical. The outer container can only be opened within local exhaust ventilation (such as a lab hood) or outdoors in an area of high ventilation.

6.1.5 Containers stored outdoors in an area of high ventilation (containers should not be stored in direct sunlight).

6.1.6 Containers of chemicals that have been characterized by representative sampling for leaks and are stored in the manner represented in the sampling. See Attachment 8.2 for a list of evaluated chemicals and appropriate storage conditions.

6.1.7 Containers stored in freezers.

6.1.8 Containers of a volume for which calculations have proven that occupational exposure limits cannot be exceeded in the event of a total release of the volume.

6.2 **Test Protocol**

6.2.1 Storage Containers:

6.2.1.1 Using the detection system, sample at the interface between the container and its sealing mechanisms (e.g. cap, bung, lid, etc.).

6.2.1.2 If no concentration above background is detected, the seal “passes” the test.

6.2.1.3 If a concentration above background is detected, tighten, realign, or otherwise attempt to improve the seal of the container. Wait about 10 minutes and re-test the seal area. If the concentration is not above background, the seal “passes” the test. Inform the owner and users of the container of the failed test and the need to seal the container in the manner that resulted in the “passing” test.

6.2.1.4 If a concentration above background is detected and attempts to improve the seal of the container still result in a concentration above background, the seal “fails” the test. The containers must either be removed from service or stored in the conditions listed in 6.1.2 to 6.1.5.

6.2.2 Process Equipment:

6.2.2.1 Using the detection system, sample potential leak surfaces of the equipment (e.g. fittings, valves, spigots, sites of damage, etc.).

6.2.2.2 If no concentration above background is detected, the seal “passes” the test.

6.2.2.3 If a concentration above background is detected, have appropriate personnel tighten, realign, or otherwise attempt to improve the seal of the equipment. Wait about 10 minutes and re-test the seal area. If the concentration is not above background, the seal “passes” the test. Inform the owner and users of the equipment of the failed test and the

need to seal the equipment in the manner that resulted in the "passing" test.

6.2.2.4 If a concentration above background is detected and attempts to improve the seal of the equipment still result in a concentration above background, the seal "fails" the test. The equipment must be repaired or replaced so that a passing test is obtained or the process terminated.

6.3 **Documentation:** Record the test results on the *BNL Chemical Leak Test Record* or an equivalent.

6.4 **Sampling Frequency:**

6.4.1 This test must be repeated:

- On a quarterly basis for storage containers not in current use.
- On a quarterly basis for process equipment when the chemical is present in the system.
- Anytime that the seal or integrity of the equipment is in question
- After any change in process equipment that has the potential to alter the seal of the equipment.

6.4.2 For processes and containers in current use, Work Planning and Experimental Review documentation should specify the frequency of monitoring and the frequency of testing of the effectiveness of engineering controls.

6.4.3 Routine employee exposure assessments sampling will indicate releases and can constitute a surrogate for the leak sampling for the purpose of OSHA Regulated Chemical leak test surveillance.

7.0 References

7.1 OSHA Methylene Chloride 29CFR1910.1052.

8.0 Attachments:

8.1 *BNL Chemical Leak Test Record*

8.2 *Test Results for Chemical Leak Testing*

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9.0 Documentation

Document Review Tracking Sheet		
PREPARED BY: *(Signature and date on file)* R. Selvey **Date 10/02/01**	**REVIEWED BY:** *(Signature and date on file)* J. Peters **SHSD IH Group** **Date 10/02/01**	**APPROVED BY:** *(Signature and date on file)* R. Selvey **SHSD IH Group Leader** **Date 10/12/01**
Filing Code: IH52QR.01	**DQAR** **Date**	**Effective Date:** **10/12/01**

Periodic Review Record		
Date of Review	Reviewer Signature and Date	Comments Attached

Attachment 8.1

BNL Chemical Leak Detection Record

(Use a facsimile of this record or equivalent)

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Chemical Name		
CMS Bar Code # or Process Equipment ID		
Test Date	**Test By**	**Pass/Fail**

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Attachment 8.2

BNL OSHA Regulated Chemical Leak Testing Representative Sampling Data

Chemical	Storage Container Type Monitored	Storage Conditions Monitored found to be Acceptable (Leak monitoring not required)	Storage Conditions Monitored found to be Un-acceptable (Leak monitoring required)	Reference
Rez-N-Bond	Original Manufacturer 1 liter metal can	Can stored within glass secondary jar.	Once opened, these metal containers allow some leakage of vapors. Electrical and masking tape allows leakage.	8.2.1
Rez-N-Glue	Original Manufacturer 1 liter metal can	Can stored within glass secondary jar.	Once opened, these metal containers allow some leakage of vapors. Electrical and masking tape allows leakage.	8.2.1
MS-111 Stripper		Transferred from manufacturer container to glass bottle with polymer sealing cap.		8.2.1
Methylene Chloride	Original Manufacturer 1-4 liter Glass Bottles with polymer lined cap	Never opened container from manufacturer. Container stored in hood.	Open bottle without outer, secondary container**.**	8.2.1

References: 8.2.1 SHSD Monitoring on 10/02/01 with Miran Sapphire Detector.